Plan to Minimize Impacts on Adjacent Landowners
Vierra Flood Protection and Environmental Enhancement Project
Flood Protection Corridor Program SAP Contract No. 4600003357

Program Background

The Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Act of March 2000 (Proposition 13) created the Flood Protection Corridor Program (FPCP). The Program is authorized to fund projects providing nonstructural approaches to flood management, including the acquisition and restoration of wildlife habitat and agricultural land preservation. Proposition 13 requires the grant applicant, in conjunction with the Department of Water Resources, develop a plan to minimize the impacts on adjacent landowners prior to acquiring any interest in land.

The code states:
"79041. Prior to acquiring an easement or other interest in land pursuant to this article, the project shall include a plan to minimize the impact on adjacent landowners. The plan shall include but not be limited to, an evaluation of the impact on floodwaters, the structural integrity of affected levees, diversion facilities, customary agricultural husbandry practices, and timber extraction operations, and an evaluation with regard to the maintenance required of any facilities that are proposed to be constructed or altered."

The plan must include an evaluation of the impact on floodwaters, the structural integrity of affected levees, diversion facilities, customary agricultural husbandry practices, and timber extraction operations, and an evaluation with regard to the maintenance required for any facilities that are proposed to be constructed or altered. This plan has been prepared by River Partners as part of a FPCP grant awarded for the Vierra Flood Protection and Environmental Enhancement Project in 2003. Restoration of lands under the FPCP grant is currently scheduled to begin in 2005.

Project Overview

Location:	Stanislaus County, approximately 12 miles west of Modesto, California and about ¼ mile south of Highway 132 (Figure 1). It is located between San Joaquin River Mile 77.5-82.5.
Goals:	• Enhance flood corridor • Improve habitat for threatened and endangered species and other species characteristic of riparian habitat • Reduce potential fish entrapment hazards
Objectives:	• Reduce flood hazards by converting lands to floodplain-compatible uses and increasing transitory floodwater storage and floodwater conveyance • Restore and enhance approximately 311 acres of riparian vegetation

- Create approximately 200 acres of wetlands
- Evaluate existing private levee breaches to reduce fish entrapment

Proponents:
- Department of Water Resources
- USFWS
- Natural Resources Conservation Service
- River Partners

Funding: Department of Water Resources, Flood Corridor Protection Program $1,755,542

Project Background

Physical Setting:
- The 3,166 acres of the Refuge that make up the West Unit, which includes the Vierra Project, lie in a naturally occurring basin. The natural rise in elevation of the topography at the western edge of the Vierra Unit is approximately 10 to 15 feet.
- A 2.2-mile long US Army Corps of Engineers (Corps) levee borders 250 acres of land on the south end of the Vierra Project (Figure 2). This Corps levee breached on the north end during the 1997 floods and has since been temporarily repaired.
- Approximately 261 acres are bordered on the river-side by 3.5 miles of private levees, which did not dependably prevent flooding on the site. These private levees breached in 1997 and have never been repaired.
- Topography and existing private levee breaches could pose potential fish entrapment hazards.

Geomorphic Setting:
- The Vierra Project is located 1 mile downstream of the confluence of the Tuolumne River and 2.5 miles upstream of the confluence of the Stanislaus River.
- Because the flow of the San Joaquin River is highly regulated by dams, the active channel of this once highly meandering, depositional reach of the river has not significantly moved for almost 100 years.
- Channel-floodplain connectivity, which generates and supports healthy riparian forests, has been eliminated by regulated flows, diversion of water for agricultural and municipal uses, and the construction of levees along the river.
- Existing breaches in private levees provide an opportunity for transitory storage of floodwaters and sediment trapping on the floodplain.

Biological Setting:
- This area is at the center of a wildlife corridor connecting the San Joaquin, Tuolumne, and Stanislaus rivers to the south Delta.

	• The Vierra Project is adjacent to Refuge lands that support high quality riparian vegetation, which provides habitat for neotropical migrant birds and other characteristic riparian species. • The project area is currently fallow, abandoned agricultural land dominated by weeds, which provide little or no wildlife habitat. • Invasive plants, particularly giant reed (*Arundo donax*), perennial pepperweed (*Lepidium latifolium*), and Johnson grass (*Sorghum halepense*) currently exist in scattered patches in the project area, but have the potential to spread into large infestations.
Surrounding Land Uses	• Refuge lands immediately border the northern, eastern, and southern boundaries of the project area. • Irrigated row crops, grains, and alfalfa are grown on agricultural lands immediately west of the project area. • Two private residences are located west of fields V1 and V2. • USFWS owns two residences west of fields V4 and V5 and an old dairy complex and residence, where the Refuge's field office is located, west of field V6. • There are no commercial or industrial facilities in the immediate site vicinity.
Regulatory Compliance	• Public Hearing: November 12, 2003 • NEPA compliance: complete • CEQA compliance: complete • Plan to minimize impact on adjacent landowners: satisfied by this document

Related Efforts

The Vierra Project is the northernmost block of several Refuge units that stretch for approximately 10 miles along the west side of the San Joaquin River. Restoration of the site will greatly enhance the continuity of riparian habitat already protected on the Refuge. This project builds on a previously implemented riparian restoration project (River Partners) of about 800 acres and accompanying wetland restoration (USFWS) of over 400 acres just south of the project area. This project also provides increased habitat potential for the endangered riparian brush rabbit being reintroduced through the efforts of the Endangered Species Recovery Program (California State University-Stanislaus) and the Least Bell's Vireo, recently found to be nesting in restored vegetation on the Refuge.

The Vierra Flood Protection and Environmental Enhancement Project is an integral, but separate part of an overall project that will restore flood flows and natural

fluvial processes across the floodplain and prevent future flood damage. In 1999, the USFWS purchased fee title and the Natural Resources Conservation Service purchased easements on 3,166 acres of floodprone agricultural lands, including the Vierra property, as part of the San Joaquin River National Wildlife Refuge (Refuge). These lands are located within a U.S. Army Corp of Engineers (Corps) nonstructural flood management project, which calls for abandoning/breaching Corps flood control levees damaged by the 1997 floods, purchasing flowage easements, and constructing a ring levee around residences owned by the USFWS and an old dairy complex that houses the Refuge field headquarters. This levee-breaching project will reduce future flood hazards along this reach of the San Joaquin River, which is subject to flood failure. An environmental assessment (for National Environmental Policy Act) completed by the Corps in 1997 found the project posed no significant adverse impacts to soils, air quality, water quality, socioeconomic conditions, land use, recreation, river hydrology, or cultural resources (Corps 1997).

Although the Vierra project is independent of the Corps levee-breaching project, it is integral to the phased restoration occurring on the Refuge (PWA 2005; Appendix I). This non-structural flood management project includes land management for flood-compatible uses and floodplain inundation behind Corps levees of up to 3,166 acres of Refuge land in some years. Flowage easements have been acquired, and the USFWS is currently working with the Corps to formalize the administrative process to implement project levee breaches. Decommissioning the levees to allow the breaches would require an act of Congress. An alternative to this involves modifying the Corps' Operating and Maintenance Manual to allow non-maintenance of the existing levee structures (or portions of structures).

The Anadromous Fish Restoration Program (AFRP) provided funding to determine strategic locations for Corps levee breaches and how flood flows would move through the Refuge. Ducks Unlimited, on behalf of AFRP, contracted with Philip Williams and Associates (PWA) to model water flows, relative to levee breaches, across the Refuge during rising and receding water levels and to evaluate alternative breaching strategies and opportunities to improve habitat for anadromous fish. PWA completed the hydraulic modeling and a final report in 2004 (PWA 2001, PWA 2004).

PWA used a one-dimensional, looped network hydrodynamic model (MIKE 11) during Phase 1 of their study to evaluate habitat effects of Corps proposed levee breaches with emphasis on anadromous fish (PWA 2001). This model predicted that with project levee breaches in place, the Refuge would begin to flood when river flows exceed 16,000 cfs. During the simulated 1994-1995 water year, the Vierra property, without drainage or losses, would remain inundated well into the following season. Phase 2 of PWA's study developed alternatives to the original Corps proposed levee breaches using a 10-year recurrence interval event and identified a preferred alternative that integrates improved floodplain habitat for anadromous fish. This study used MIKE 11 to model the main San

Joaquin River channel and associated floodplains within the project levees and used a two-dimensional, depth averaged hydrodynamic model, MIKE 21, to predict inundation frequency, area, duration, timing, and depth of flooding on the floodplain units of the Refuge (PWA 2004). This study predicted the Vierra property floods at about 11,000 cfs, approximately a 2-3 year event after levee breaches are completed, and that the levee breaches will reduce local flooding impacts up to 0.3 feet for a 10-year event. Water surface elevations may be further reduced during larger flows, which were not modeled as part of this particular study.

Department of Water Resources' Interest in Providing Funds to Develop the Vierra Flood Protection and Environmental Enhancement Project

The Flood Protection Corridor Program has awarded $1,755,542 to River Partners to restore and enhance 511 acres of riparian vegetation and wetlands on the Vierra portion of the West Unit of the San Joaquin River National Wildlife Refuge (Figure 1). Restoration of riparian vegetation and wetlands will improve wildlife habitat on the Refuge, provide transitory storage of floodwaters, increase sediment trapping during flooding, and reduce fish entrapment hazards. The project will be designed to ensure that there are no negative impacts to neighboring landowners resulting from the construction of the project.

Evaluation of Project Impacts on Floodwaters

The Vierra project will enhance flood hazard reduction goals by converting lands to floodplain-compatible uses and increasing transitory floodwater storage (PWA 2005; Appendix I). This project will add to the flood hazard reduction and habitat enhancement benefits of the larger Corps levee-breaching project (PWA 2005). The northern Vierra unit, which is surrounded by private levees, will provide conveyance flows back into the San Joaquin River when the Corps levees are breached.

PWA used previous modeling undertaken for the Corps levee-breaching project at the Refuge, past modeling by the Corps, and qualitative analysis to evaluate hydraulic effects of the Vierra project (PWA 2005). PWA determined that the Vierra project and the Corps levee-breaching project would significantly reduce flood hazards. One main benefit of these projects is the conversion of lands previously subject to flood damage to land uses (floodplain habitat) that benefit from flooding. These lands will no longer need to be protected from floods with project or private levees, which must be maintained and repaired.

The Corps nonstructural flood management project is expected to reduce local water surface elevations during flood events. Modeling used by the Corps (UNET and Flo2D models) as part of the Sacramento-San Joaquin Rivers Comprehensive Study,

estimated a local 0.7-1.9 foot reduction in the 100-year peak flow (71,800 cfs) water surface elevations, with assumed no change in roughness levels.

PWA's hydraulic modeling of the Refuge suggested that with the proposed Corps levee breaches, the Vierra unit would begin to flood when San Joaquin River flows reach 11,000 cfs, about every two to three years (PWA 2004). The modeling results indicate that Corps levee breaching could attenuate San Joaquin River flows with up to a 0.3 feet stage reduction for approximately a 10-year event, with potential greater reductions for larger flows.

PWA used qualitative assessment techniques to evaluate the expected impacts of roughness changes at the site on flood event hydraulics. The current Manning's n for the site, which is dominated by non-native weeds with scattered black willow and cottonwood recruits, was estimated to be between 0.04 and 0.06 using standard tables and engineering judgment (PWA 2005). Average floodplain velocities, using the Corps Flo2D model, were estimated as less than 1 foot/second for the 100-year flood event for northern Vierra. These modeling results reflect the backwater effects caused by Maze Road Bridge, downstream of the project site. This structure and surrounding levees constrict the river during high flow events, slowing the water upstream. The low velocities on the northern Vierra floodplain will minimize the effects of new floodplain vegetation on water surface elevations, or reduce the effects of Manning's n on the water surface profile, in this reach during high flow events (PWA 2005).

Either passive or active revegetation of the floodplain is expected to increase Manning's n compared to the historical agricultural use of the site. Manning's equation calculations were used to assess the potential increase in Manning's n as a result of riparian restoration on the 100-year flow water surface elevation on northern Vierra (PWA 2005). It is extremely unlikely that roughness values on northern Vierra would increase to a level that would eliminate the expected reduction in water surface elevations of the larger Corps levee-breaching project (PWA 2005). Riparian restoration plantings would have to increase Manning's n from 0.04 to 0.20, which is much higher than is typical of natural floodplains, to negate flooding benefits of the Corps levee-breaching project (PWA 2005).

An evaluation was made of the relationship of levee heights to nearby structures that might be affected by a change in water surface elevations at the Vierra unit (PWA 2005). The private levee surrounding the northern Vierra unit is about 1-2 feet below the private lands adjacent to this unit (to the west). The Corps levee surrounding the southern Vierra unit is about 9 feet above the private levee. Since the Corps levee is not overtopped in the modeled 100-year and 60-year events, the southern Vierra unit is considered to be outside the floodplain without the Corps levee-breaching project. The private levees and private land adjacent to nearby structures are significantly overtopped by both flood events, whether or not the Corps levees are breached. Northern Vierra and

the nearby structures will likely be inundated during a 60-year or larger flood event with the Corps levee-breaching project in place (PWA 2005).

The Vierra project will be designed to minimize flooding impacts. Because the southern Vierra unit is outside the 100-year floodplain, restoring riparian vegetation in this area will not impact flood conveyance. The northern Vierra unit is within the 100-year floodplain, increasing roughness in this area may reduce floodwater conveyance and/or increase the water surface elevation during large flood events (PWA 2005). River Partners will minimize flooding impacts by reducing roughness through primary flow paths including creating wide, open corridors (wetlands), planting vegetation with low resistance, and planting species parallel to the flood flow paths (PWA 2005).

The USFWS is responsible for the long-term maintenance and management of the Vierra Unit. Through maintenance and monitoring, the USFWS will evaluate flood conveyance through the project area to avoid floodwaters backing up and adversely affecting adjacent properties for all but the most extreme flood events (100-year recurrence interval or greater).

Evaluation of Project Impacts on Structural Integrity of Affected Levees

This project will have no negative impacts on levees. The Corps levees will be breached as part of a separate nonstructural flood management project. Although the Vierra project funded by the FPCP is independent of the future planned breaching of Corps levees, future breaching will be incorporated in restoration planning and design. The breaching of the Corps levee will to allow river flood waters to spread over the former floodplain, increasing overbank storage capacity (Corps 1997).

Because the confluence with the Tuolumne River is just upstream from the project area, this reach of the San Joaquin River is turbulent, which makes the area susceptible to levee erosion and damage and levee failure. Restoration of riparian vegetation will reduce wind-wave action and flood flow erosion on the floodplain, including Corps levees (PWA 2005). Riparian vegetation will reduce fetch lengths across the unit, therefore reducing potential erosive forces due to wave action (PWA 2005).

Only minor grading of land will be required to create wetland basins and an approximate 20-foot buffer between wetland basins and Corps levees will not be excavated. Excavated material will be used to construct flood refugia for the endangered riparian brush rabbit on the land side of the Corps levees, to repair berms along existing drainage canals within the project area, and potentially to construct ring levees around USFWS residences and buildings west of the project area and at the old dairy complex.

Evaluation of Project Impacts on Diversion Facilities

This project will have no negative impacts on diversion facilities. West Stanislaus Irrigation District's irrigation intake canal is located approximately 2 miles upstream of the project area. Blewett Mutual Water Company and El Soyo Irrigation District's pump station is located within ¼ mile of the northern portion of the project area. The Vierra project will enhance flood hazard reduction goals by converting lands to floodplain-compatible uses and increase transitory floodwater storage (PWA 2005). This project will also add to the flood hazard reduction and habitat enhancement benefits of the larger Corps levee-breaching project (PWA 2005).

No operational diversion facilities exist on site. Two old dilapidated river pump stations will be repaired, including refurbishing pier structures and pump systems. These will serve as a source of irrigation water for the riparian vegetation restoration and for long-term wetland management. Fish screens, which meet NOAA specifications, will be installed on the river pumps.

Evaluation of Project Impacts on Customary Agricultural Husbandry Practices

This project will have no negative impacts on customary agricultural husbandry practices. The nearest active dairy is located approximately 2.5 miles east of the project area. Sheep have heavily grazed the abandoned agricultural lands within the project area during 2002-2004 to control weeds in the interim between land acquisition and restoration. No grazing on the Vierra unit has occurred in the last year.

Evaluation of Project Impacts on Timber Extraction Operations

The project will not impact any timber extraction operations. There are no timber extraction operations in the vicinity of the project.

Evaluation of Project Impacts on Maintenance of Any Facilities Proposed to be Altered or Constructed

This project does not involve the alteration or construction of facilities. The project area is owned and managed by the USFWS, which annually assesses maintenance activities and needs on Refuge lands.

Corridors for utilities on site, including Hetch Hetchy power lines and pipelines, will be integrated into the restoration design and maintained. Only native grasses and forbs will be planted in these areas to allow future access and maintenance of these corridors.

Project Communication

River Partners maintains an open communication policy with adjoining landowners and makes a considerable effort to anticipate any impacts or neighbor concerns associated with projects. River Partners has contacted adjacent landowners to discuss the project and any related concerns.

Conclusion

This plan describes the overall Vierra Flood Protection and Environmental Enhancement Project and describes a plan to minimize impacts on adjacent landowners for associated wetland and riparian vegetation restoration activities to be funded by the FPCP. The plan contains evaluations of the FPCP impacts on existing conditions of floodwaters, the structural integrity of affected levees, diversion facilities, customary agricultural husbandry practices and timber extraction operations, and with regard to the maintenance required for any facilities that are proposed to be constructed or altered by the Project. In summary, it is not anticipated that the development of the FPCP and/or its subsequent maintenance will have any significant adverse impacts upon the existing adjoining property owners, land use practices, or flood control facilities, and the FPCP will enhance flood hazard reduction goals by converting lands to floodplain-compatible uses and increase transitory floodwater storage (PWA 2005), in addition to increasing habitat for a variety of wildlife species including threatened and endangered species. This project is also integral and complimentary to the larger Corps levee-breaching project (PWA 2005).

References

Corps. 1997. Environmental Assessment. PL 84-99 Levee Rehabilitation, Reclamation District 2099, San Joaquin River Basin, Stanislaus County, California. July 29, 1997.

PWA. 2001. San Joaquin River National Wildlife Refuge Phase 1: Analysis of proposed levee breaches. Prepared for Ducks Unlimited, Inc. and US Fish and Wildlife Service.

PWA. 2004. San Joaquin River National Wildlife Refuge Phase 2: Habitat implications of levee breaching alternatives. Prepared for US Fish and Wildlife Service.

PWA. 2005. San Joaquin River National Wildlife Refuge: Vierra unit restoration project hydraulic assessment. Prepared for River Partners.

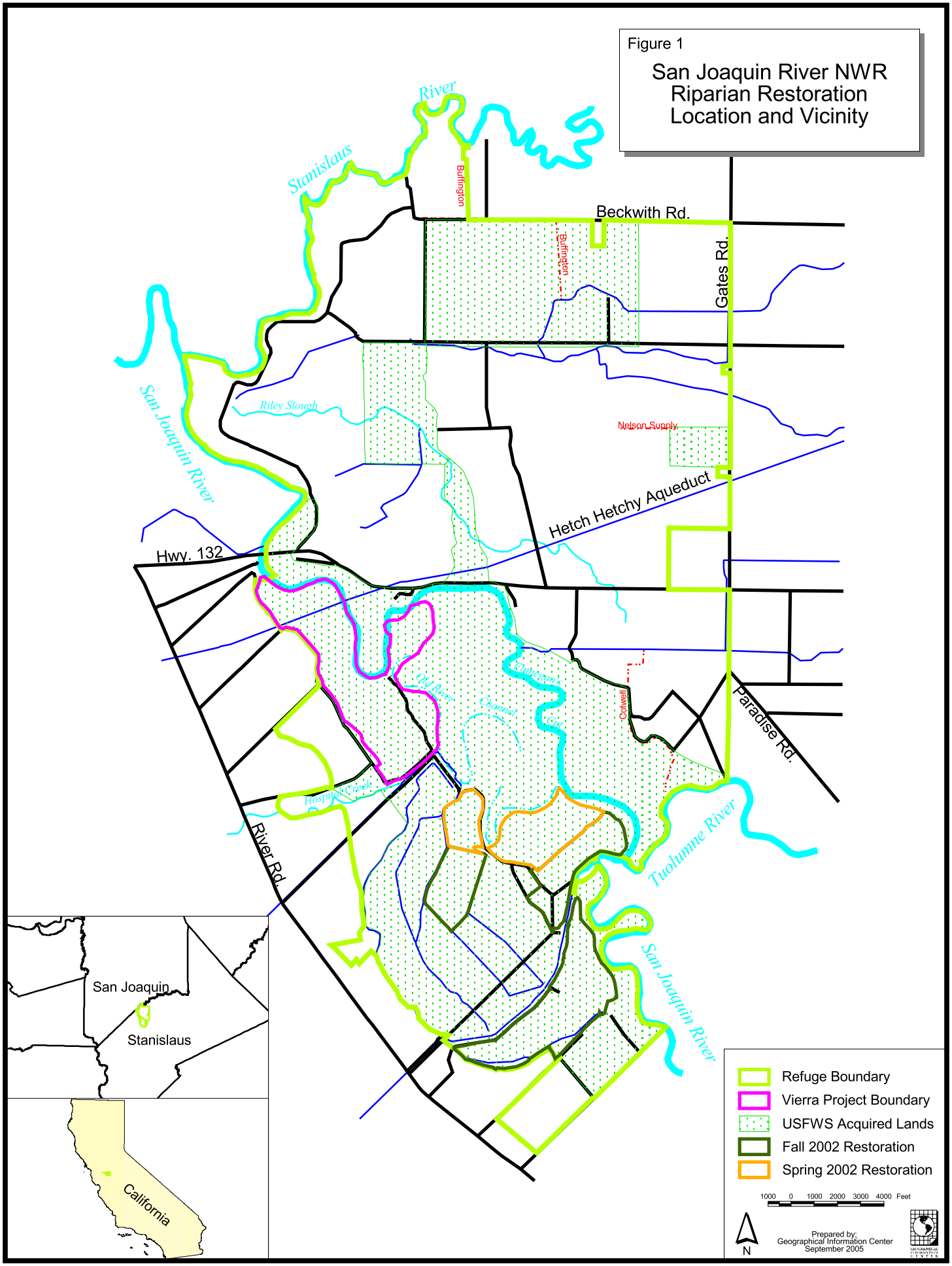
Figure 1
San Joaquin River NWR
Riparian Restoration
Location and Vicinity
Stanislaus River
Buffington
Beckwith Rd.
Gates Rd.
San Joaquin River
Riley Slough
Nelson Supply
Hetch Hetchy Aqueduct
Hwy. 132
Paradise Rd.
River Rd.
Tuolumne River
San Joaquin River
San Joaquin
Stanislaus
California
Refuge Boundary
Vierra Project Boundary
USFWS Acquired Lands
Fall 2002 Restoration
Spring 2002 Restoration
1000 0 1000 2000 3000 4000 Feet
N
Prepared by:
Geographical Information Center
September 2005

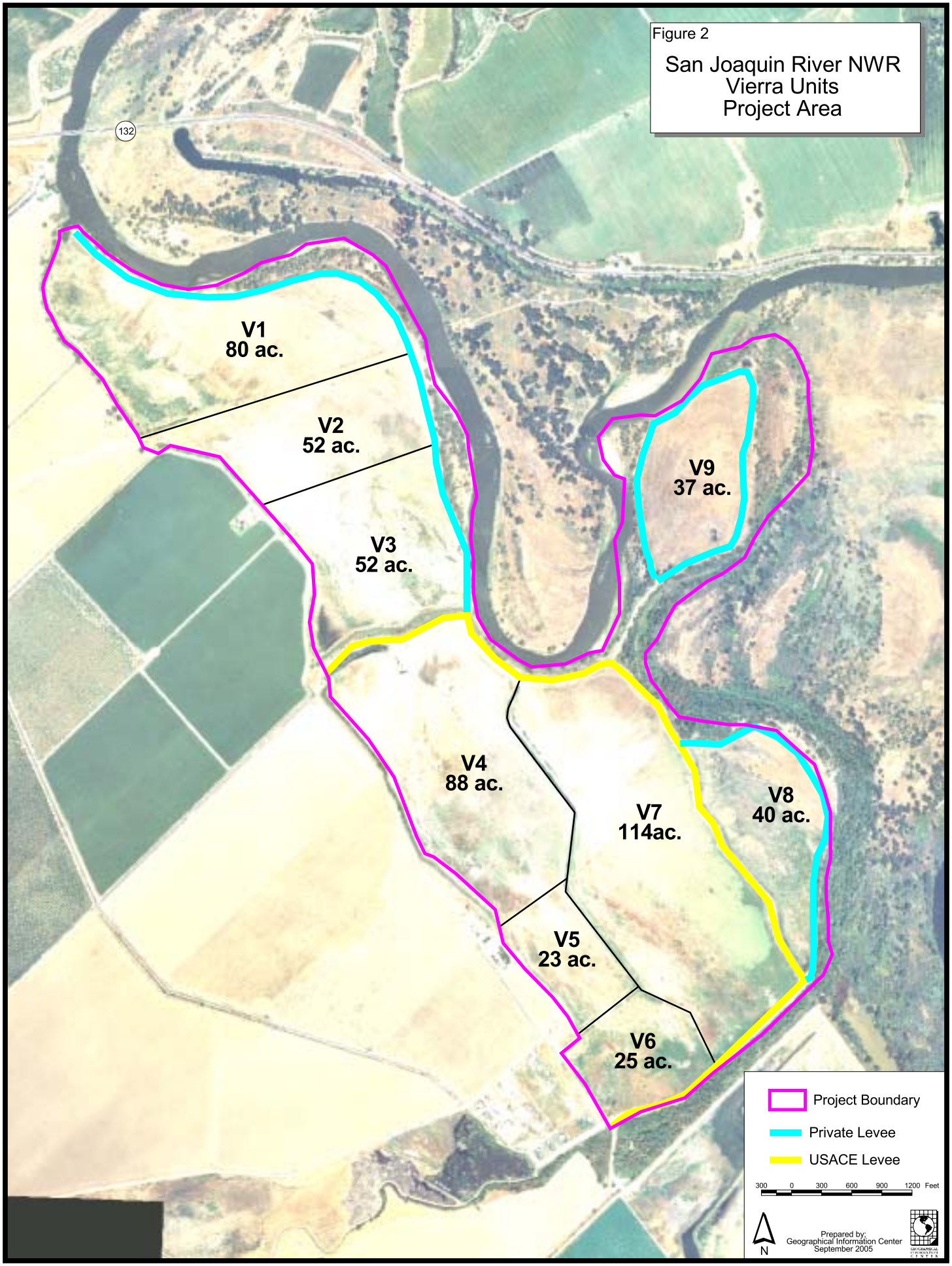
Figure 2
San Joaquin River NWR
Vierra Units
Project Area
132
V1
80 ac.
V2
52 ac.
V3
52 ac.
V4
88 ac.
V5
23 ac.
V6
25 ac.
V7
114ac.
V8
40 ac.
V9
37 ac.
Project Boundary
Private Levee
USACE Levee
300 0 300 600 900 1200 Feet
N
Prepared by:
Geographical Information Center
September 2005